

US EPA ARCHIVE DOCUMENT

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**Before the Subcommittee on Environment, Technology and Standards**  
**Committee on Science**  
**U.S. House of Representatives**  
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Good afternoon, Mr. Chairman and Members of the Subcommittee, I am honored to appear before you today to discuss the Fiscal Year (FY) 2003 budget request for the U.S. Environmental Protection Agency's (EPA) Office of Research and Development (ORD), and to share with you some of what I have found regarding the uniqueness and success of ORD's research program as I have recently taken over as Assistant Administrator for ORD.

ORD conducts leading-edge research and fosters the sound use of science and technology in environmental decisions in support of EPA's mission to protect human health and to safeguard the natural environment. ORD research tackles problems to which resolutions will have immediate public health and environmental benefits. The advancement of the science and the development of answers to questions posed by environmental issues make EPA unique among federal agencies. No other federal agency has a comprehensive program in environmental public health and ecological impacts. No other agency is researching these issues in an integrated fashion. In addition, no other agency, despite large research budgets, can claim an impact on EPA's decision-making. EPA has clearly followed the NAS recommendations on research in support of risk-based decision-making - doing the right science and doing the science right.

## **INTRODUCTION**

ORD's total budget request for FY 2003 is \$627 million and 1945 work years. Of this amount, \$514M is in the Science and Technology (S&T) Appropriation representing 75% of the Agency's S&T account. With this request, we expect to maintain our momentum in critical environmental programs such as Children's Health Research, Drinking Water Research, and Particulate Matter Research. In addition, ORD will launch new research initiatives in areas such as Homeland Security, Computational Toxicology, Biotechnology, and the Central Basin Integrated Assessment. The FY 2003 Request positions ORD to address the Agency's most pressing research and development needs while remaining on the cutting edge of scientific and technological developments.

## STRENGTHENING SCIENCE

The credibility of EPA's decisions on the protection of human health and the environment depends on the strength of the science underpinning them. In fact, the quality of the science used by the Agency largely determines how well our environmental programs actually work, i.e., whether they achieve our health and environmental goals. Only a strong commitment to science can define the environmental challenges of the future and the best methods to address these challenges. I would like to thank my predecessor, Henry Longest, Acting AA for ORD, for the progress made in strengthening science at EPA through a number of successful ORD organizational improvements. His efforts helped to ensure that ORD research results provided credible, relevant, and timely support designed to inform EPA policy decisions.

I believe that scientific analysis should drive policy, and just as importantly, that neither policy nor politics drive scientific results. I know Governor Whitman is committed to ensuring that science informs policymaking at EPA now more than it ever has before. She has told me, loudly and clearly, that she is looking to me to exercise strong leadership to make sure that it does. I look forward to meeting this challenge. I will ensure that strong science plays a prominent role in all EPA decisions – regulatory and non-regulatory. During my tenure at ORD, I want the quality of EPA's science to be recognized and to be higher than it ever has been.

Making environmental decisions based on sound science requires *relevant, high quality, integrated, cutting-edge research* in human health, ecology, pollution prevention and control, and in socio-economics. To maintain both short and long-term *relevance* to EPA's mission, ORD's scientific research activities must reflect a balance across both problem-driven research and core research, as recommended by the National Academy of Sciences. To ensure the *quality* of our research program, ORD uses a coordinated, cooperative research planning process; rigorous, independent peer review; and inter-agency partnerships and extramural grants to academia that complement EPA's own scientific expertise. Lastly, ORD keeps a *leading* edge in research by focusing our efforts and resources on those areas where EPA can add the most value towards reducing uncertainty in risk assessments and towards enhancing environmental management.

Making environmental decisions built on sound science also includes ensuring that scientific findings are properly characterized and that science is used appropriately in the decision making process. To properly characterize scientific findings, the knowledge, assumptions, uncertainties, and disagreements regarding the science must be clearly stated. EPA's *Risk Characterization Handbook* guides the Agency in this area by providing criteria regarding transparency, clarity, consistency, and reasonableness in EPA risk assessments. The appropriate use of science in EPA decision-making is critical to the Agency's credibility. Addressing this concern was a central theme in Governor's Whitman's Task Force which reviewed the Agency's regulatory development process last summer.

While the Task Force found that the existing regulatory development process was sound, it did offer some recommendations to improve the involvement of scientists. For example, the

Task Force recommended that an EPA Science Advisor be appointed and provide the leadership needed to assure that strong science play an increasingly prominent role in Agency decision-making. The Task Force also recommended that EPA scientists be involved throughout the decision-making process and help determine additional research and analyses needed to support sound decision-making. The Administrator has embraced the Task Force recommendations and has indicated her intent to appoint an EPA Science Advisor in near future.

The recommendations of the Administrator's Task Force pose significant challenges for ORD. Since more complex environmental science will now be included in the Agency's regulatory and non-regulatory decision-making process, ORD will be participating in more science policy decisions than ever before. The level of our participation will also increase as we assist the Program Offices in identifying the research and scientific analyses needed to support their policy-making. In short, our participation is not just desired, it is expected to ensure that EPA's policies are based on the strongest possible science.

Therefore, the President's FY 2003 budget request includes additional resources (\$1 M and 5 FTE) to enhance ORD's program support efforts. These additional resources will enable ORD researchers to increase their efforts to: (a) help other Agency scientists scope proposed regulations and decisions towards determining what types of research and scientific assessments will be needed, (b) review plans to properly identify data needs towards supporting a regulation, (c) assist in the development of scientifically defensible regulatory options, (d) ensure that technical products underpinning Agency decisions meet the Agency's guidelines for information quality, including rigorous peer review; and, lastly (e) ensure that the science underpinning our decisions is characterized appropriately, understandable, and that EPA managers have the best possible scientific information when making policy decisions.

Frankly, Mr. Chairman, the requested additional resources, in and of themselves, are only part of the solution. Rather, I intend to charge my ORD Office, Laboratory, and Center Directors to redouble their efforts devoted to program support. To fully meet the recommendations of the Administrator's Task Force and the Administrator's expectations of me, I must increase ORD's role in Agency decision-making and focus our research efforts – at the bench, in the field, and in our assessments – in those areas that will provide the strongest science towards informing environmental decisions.

## **EXAMPLES OF RECENT ORD SCIENTIFIC ACCOMPLISHMENTS**

The following highlights showcase ORD's leadership in meeting the scientific challenges of environmental and human health protection as well as the striving for leading-edge science and engineering in support of environmental decision-making.

- **PM** - Ten years ago our major concern related to particulate matter in air (PM) was on

pulmonary disease, but there was little understanding of biological mechanisms of effect. Since then, as the result of moving away from an exclusive focus on the lung, we have seen invaluable results from studies on: the correlation of PM with cardiovascular mortality; the link between PM and asthma aggravation in children; the demonstration of an association between cardiac regulation and PM; effects on the cardiovascular system; new insights on possible mechanisms of action; and the association of PM with lung cancer. Much of this work was reported by university researchers funded by ORD, other work was completed by EPA scientists.

- **Microarrays** - Gene chips, or DNA “microarrays,” which combine biological with computerized capabilities, are being developed and used as diagnostic tools in numerous applications.
  - To evaluate a water supply’s safety, the US EPA and others currently rely on indirect methods which either measure indicator bio-organisms or on methods which use animal testing. A microarray approach under development will allow rapid testing of drinking water for harmful pathogens and chemical pollutants. This test will measure recently identified cellular messenger RNA (mRNA) shifts provoked by chemical or microbiological contaminants.
  - In a study on genetic landmarks of male fertility, in collaboration with academia, a microarray method to identify male infertility has been developed. This analytical tool may aid in the detection and study of environmentally- or chemically-induced male infertility.
  - In the new field of ecotoxicogenomics, microarray technology will allow unprecedented analytical speed in the understanding of how pollution levels affect an ecosystem. A critical need in watershed monitoring is the simultaneous diagnosis of field organisms’ exposure to individual chemicals within mixtures of environmental stressors. Because there is very little gene sequence information available for target field organisms, an approach involving several different molecular biological methods has been developed to identify stressor-specific microarray reactions. Linkage of the earliest indicators of exposure to adverse effects in organisms and populations is sought. ORD expects to nurture research, through a STAR grant, with the goal of a test for water conditions and diagnostics using a single microarray slide.
- **Lung Cancer Biomarker** - A recent study determined the feasibility of a sensitive assay to detect a biomarker in sputum identified as useful for assessing lung cancer risk in humans. Since sputum samples are easy and non-invasive to collect, this assay can be used for large scale epidemiological studies in the assessment of lung cancer risks.

- **Computational Sciences:** The Agency often needs data about chemicals that is very expensive and time-consuming to collect. In order to save time, resources, and to minimize the amount of animal and other laboratory testing required, computerized alternatives have been explored.
  - Using magnetic resonance technology and pharmacological models, ORD has created a virtual fish that allows us to simulate exposure to chemicals and to accurately describe the uptake and distribution of chemicals in fish tissues. This *in silico* (computer-based) test method has been evaluated for chemicals which have vastly different bioaccumulation potentials, a major indicator of environmental hazard. The virtual fish is now being fitted with a virtual liver capable of simulating major metabolic pathways of pesticides and toxic chemicals.
  - ORD's SPARC (SPARC Performs Automated Reasoning in Chemistry) computer program is designed to calculate many characteristics of chemicals based on molecular structure. This program represents the next generation in knowledge-based, structure/activity relationships (SAR).
- **New Technology** - ORD scientists are developing technologies to better measure the distribution and control the impact of contaminants on people and the environment.
  - In collaboration with the University of Kentucky, a novel adsorptive membrane system has been developed that can efficiently remove toxic heavy metal impurities from flowing water. ORD and Kentucky researchers have obtained three joint patents in this promising new "nanotechnology." In it, molecules with the ability to selectively adsorb metals are attached to the surface of membranes with microscopic-sized pores. These molecules, "polyfunctional ligands," capture metals with molecular recognition precision to yield capture capacities that are at least ten times larger than current practice. Lead, barium, and chromium have been studied and the current focus is on removing metallic mercury from power plant flue gases.
  - In support of the Food Quality Protection Act, ORD is collaborating with EPA's Office of Prevention, Pesticides and Toxic Substances, other government agencies, and academia to develop methods, data, and models for evaluating children's aggregate exposure to pesticides by all relevant pathways. ORD developed a children's body suit (a "cotton dosimeter") to collect exposure data during a child's "normal" day. This will lead to specific information on how children are exposed to pesticides and other pollutants while in their own unique settings.
  - A small biosensor was recently developed for use by EPA's Office of Water to



screen drinking water for the presence of organophosphate and carbamate insecticides. This technology is likely to find far reaching applications in the protection of our water supplies.

- Transport of mercury across continental boundaries and oceans is a significant environmental problem. ORD recently identified a form of mercury that deposits much more readily and closer to its origin than does the traditionally measured form of mercury vapor. ORD developed a new instrument for measuring this form of mercury – reactive gaseous mercury (RGM). Working with the National Oceanic and Atmospheric Administration and others, ORD is measuring RGM in hopes of understanding the local impacts of mercury as well as the patchy nature and cycling of the global distribution of mercury in the environment.
- A new, rapid, *in vitro* screening test may identify organophosphorus pesticides that are more acutely toxic to the young. Human genetics and physical attributes both play a role in the ability of a chemical to cause effects in people. Research has shown that an enzyme that breaks down the pesticide chlorpyrifos is present only in some adults and not in children from 0-12 months old. This is an important step in understanding why and how some people may be more susceptible to the adverse effects of exposures to pollutants in the environment. These types of tests could also be used to assess the detoxification of chemicals by human tissues in order to compare the detoxifying capability between humans of the same age (intrahuman variability) and between age groups (age-related variability).
- **EMAP** - After a period of learning, ORD's Environmental Monitoring and Assessment Program (EMAP) is now providing scientifically defensible determinations of the condition of all of the nation's stream and estuarine waters. Application of EMAP tools is being done in collaboration with States and other federal agencies to enable the detection of the changes and trends in ecological conditions that are needed to make effective management and policy decisions. Many States are now using EMAP-designed monitoring methodologies as a cost-effective means of routine monitoring in addition to their participation in ORD assessment surveys. The *National Coastal Condition Report* is a primarily ORD-authored prototype for ORD's national report card on the health of the nation's estuaries, due in 2003.

These results have come about through a coordinated program of intramural research coupled with a focused extramural grants program. They will have direct impacts on Agency decisions in areas such as water quality, pesticide risks, regional ecological vulnerability and particulate matter in the air.

## EPA'S FY 2003 SCIENCE AND TECHNOLOGY BUDGET

The President's FY 2003 request reflects the Administration's commitment to pursuing sound science at EPA. The Agency's statutory responsibilities are bound closely to scientific knowledge of human health and environmental problems, and it is therefore critical that research and scientific assessment be integrated with EPA's policy and regulatory activities. In addition, the increasingly demanding issues facing the Agency necessitate a high-quality, integrated research program in order to develop sound scientific bases for its decisions. Key Administration research priorities in the FY 2003 request for EPA include:

- **Computational Toxicology (\$3 M)** - One of the highest priorities to numerous EPA programs is enhancing the scientific basis and diagnostic/predictive validity of existing and proposed chemical testing programs. The computational toxicology program seeks to use the modern tools of molecular biology (e.g., genomics and bioinformatics) along with computational science (e.g., quantitative structure activity relationships - QSARs) in order to make the testing programs of EPA more predictive, reliable, and less reliant on the use of animals. The Agency is employing techniques of molecular profiling as the foundation for determining genes responsible for specific mechanisms of endocrine disruptor toxicity; bioinformatics tools for pattern recognition are being applied to diagnose patterns of genes associated with chemicals to known mechanisms of toxicity; and lastly, QSARs are being developed to characterize and model chemical structures associated with known mechanisms of toxicity and to compare them against other chemicals.
- **National Environmental Technology Competition (NETC) (\$10 M)** - EPA will facilitate the adoption of innovative environmental technologies by the public and private sectors through the National Environmental Technology Competition (NETC). This new effort for FY 2003 addresses both the need for innovative technologies with proven performance to solve high priority problems and the reluctance of the environmental technology sector to invest in a regulatory driven market until the investment opportunities are more clearly defined. Through NETC, EPA and its stakeholders will identify and prioritize high priority problems that can benefit from targeted, cost-effective technological solutions. EPA will develop competitive solicitations for technologies in a specified problem area (e.g., arsenic removal) and an external peer review panel will select the most-promising technologies. In an effort to enhance the marketability and use of these innovative technologies, EPA will offer the selected technologies honorary awards and recognition and other support to assist in commercialization.
- **Central Basin Integrated Assessment (\$5 M)** - This initiative refines and extends the Environmental Monitoring and Assessment Program (EMAP) approach to the large rivers of the Central Basin. Through cooperative programs with the Regions, states, Tribes and other Federal agencies in the Central Basin, EPA proposes to fill remaining scientific gaps currently limiting our ability to measure the condition of large rivers. In FY 2003, EPA will expand research on indicators, monitoring designs, and sampling techniques for the upper Missouri river to include the lower Missouri and upper Mississippi rivers. The



approaches and technologies developed will be transferred to the many stakeholders within the Central Basin to enable coordinated, scientifically defensible, long-term monitoring. Data from such monitoring can provide support to managers in the establishment of total maximum daily loads and in meeting water quality standards. These approaches and technologies build on successful efforts in the Mid-Atlantic, western U.S., and coastal regions, and will also have widespread applicability to all of the Nation's large rivers.

- **Homeland Security** (\$75 M) - The recent events in the aftermath of September 11, 2001 demonstrate the need for a coordinated federal, state and local response to a wide variety of biological and chemical threats. EPA will provide guidance, technical expertise and support to federal, state and local governments and other institutions on building contamination (chemical and biological) prevention, treatment and cleanup activities. In FY 2003, research will focus on five major areas of Homeland Security: detection of contaminants, containment of contaminants, decontamination of indoor materials, disposal of contaminated supplies/equipment, and technology transfer. Activities will include: testing and verification of existing contaminant detection devices as well as methods for preventing the spread of contaminants, the decontamination of indoor materials, and incineration of contaminated clean-up equipment. Development of new methods and devices will also be undertaken. In the area of technology transfer, provisional guidance will be developed on improved detection, containment, and decontamination methods.
- **Biotechnology** (\$5 M) - Biotechnology presents a wealth of opportunities to improve productivity, provide resistance to pests and other stressors, and increase nutritional value through genetic modification of crop plants. This research initiative will provide information needed to evaluate three significant concerns: 1) potential allergenicity of proteins introduced into the food supply by engineered crops; 2) potential adverse ecological effects on non-target species; and 3) potential development of pest resistance to the genetically modified crops. This research will result in improved capability to assess the risks of allergenicity from genetically altered food, improved capability to assess the ecological risks associated with genetically modified organisms, and tools to manage gene transfer and resistance.

Our FY 2003 budget request builds upon ORD's significant accomplishments, supports the Agency's mission, and provides the scientific and technical information that is essential for EPA to achieve its long-term goals. The research and development program outlined in our budget request reflects both ORD's highly effective in-house research program, and our efforts to partner and work with other research organizations. Our resources are spread over eight of the ten Agency strategic goals, focusing on core science issues that cross environmental media and on more specific problem-oriented research. I would like to briefly highlight ORD's planned research contributions to each of these eight goals.

## **Goal 1 – Clean Air**

EPA's Air Research Program is broadly divided into two main parts: National Ambient Air Quality Standards (NAAQS)-related research, and Air Toxics research. NAAQS-related research supports the Agency's Clean Air Goal to meet national clean air standards for carbon monoxide (CO), sulfur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), lead, tropospheric ozone, and particulate matter (PM). Tropospheric ozone research will evaluate and refine emissions and air quality models to support efforts by the Agency, state, Tribal and local regulators, as well as industry, to improve State Implementation Plans for tropospheric ozone. The Agency's particulate matter research portfolio is aligned with the ten priority topics recommended by the National Academy of Sciences (NAS). The NAS recommendations describe a research program that would resolve issues of scientific uncertainty regarding (a) the science underlying the 1996 Air Quality Criteria Document for Particulate Matter, (b) our scientific knowledge regarding susceptible subpopulations and hazardous PM components, and (c) the implementation of the current PM standards. EPA's PM research plan addresses several critical research issues which are included in multiple NAS topics. Research on air toxics investigates the root causes of the environmental and human health problems in urban areas related to these pollutants. This research also supports atmospheric and emission modeling in order to estimate fate, ambient concentrations, and mobile source emissions of air toxics at a more refined scale. Air toxics research will focus on completing health assessments for some of the highest priority hazardous air pollutants, and providing the health effects data, measurements, methods, models, information, assessments and technical support to Agency, state, Tribal and local regulators to estimate health effects and exposures to hazardous air pollutants both indoors and outdoors and to reduce risks.

## **Goal 2 – Clean & Safe Water.**

To support the research provisions of the 1996 Safe Drinking Water Act (SDWA) amendments, the Agency's drinking water research will develop dose-response information on disinfection by-products (DBPs), waterborne pathogens, arsenic, and other drinking water contaminants for characterization of potential health risks from consuming tap water. The focus will be on filling key data gaps and developing analytical detection methods for measuring the occurrence of chemical and microbial contaminants on the Contaminant Candidate List (CCL). The Agency will develop and evaluate cost-effective treatment technologies for removing pathogens from water supplies while minimizing DBP formation, maintaining the quality of treated water in the distribution system, and preventing the intrusion of microbial contamination. Research efforts will also continue to support arsenic-specific research and development of more cost-effective treatment technologies for the removal of arsenic from small community drinking water systems. This work will include strategies for the acceptable control of water treatment residuals enriched with arsenic.

Research in this goal will also include work on suspended solids and sediments. Although suspended solids and sediments are a natural part of aquatic ecosystems, excess levels have been identified as one of the leading causes of water quality impairment for streams and rivers. This

research will develop tools to establish natural background levels of sediments and suspended solids inherent to a region as a first step in determining what levels of sediment are harmful to aquatic life. Research in this goal will also include continuing efforts to determine the risk associated with nutrient loadings leading to eutrophic condition, hypoxia, and increased frequency of harmful algal blooms. Another area of research will focus on the risk of infectious diseases resulting from exposure to microbes in recreational waters. EPA will perform a suite of epidemiological studies needed to establish a stronger, more defensible link between water quality indicators and disease. These epidemiological studies will provide more reliable information about the relationship between recreational water quality and swimming-associated health effects. This will enable EPA to provide states with consistent monitoring methods, standardized indicators of contamination, and standardized definitions of what constitutes a risk to public health.

### **Goal 3 -- Safe Food**

The Food Quality Protection Act (FQPA) mandates a single, health-based standard for all pesticides in all foods and provides for special protections for infants and children. Current approaches to human health risk assessment focus on single pesticides via single exposure routes (via food, drinking water, etc...) and do not adequately account for cumulative risks arising from complex exposure patterns and human variability due to age, gender, pre-existing disease, health and nutritional status, and genetic predisposition. Existing tools for controlling and preventing exposure are limited to certain processes and materials. In FY 2003, research will help improve exposure information, distributions of key exposure factors (especially across age groups for children and exposures for other susceptible subpopulations), and help address the complex exposure assessment requirements for FQPA. Health effects research will contribute to evaluating the effects of cumulative exposures to pesticides and toxic chemicals, including both long-term exposures and multiple acute exposures. The Agency will continue the scientific efforts to develop a systematic approach for determining the cumulative risk as directed by the FQPA. Further understanding of the cumulative and aggregate risks associated with exposure to pesticides and toxic chemicals will provide the foundation for improved regulatory decisions.

### **Goal 4 – Preventing Pollution and Reducing Risk**

Currently, there are some information gaps with regard to the understanding of actual human and ecological exposures to pesticides and toxic substances. To address those data gaps, this research will provide a strategic framework for developing an integrated suite of tools and models that will enhance EPA's procedures for assessing the risks to human health and ecological systems associated with commercial chemicals, microorganisms, and genetically modified organisms. In FY 2003, health effects research under this goal will continue to focus on development of mechanistically-based predictive models for human health risk assessment, such as structure-activity-relationship models. This work will help determine testing needs under Section 5 of the Toxic Substances Control Act (TSCA), which addresses the introduction of new chemicals into commerce. Research will address the need for methods to evaluate effects

associated with a variety of exposure conditions and the special sensitivities of certain subpopulations (including children) based on age, genetic factors, and health status. These methods will be used to evaluate endpoints of toxicity that are qualitatively different from those of concern for the general population. EPA will continue to participate in the Agriculture Health Study (AHS). The primary objective of the EPA exposure study is to collect high quality exposure data that can be used to evaluate how accurately the AHS questionnaire classifies pesticide application activities and enables the prediction of applicator exposure and dose.

### **Goal 5 – Better Waste Management**

Contaminated sites research focuses on improving scientific understanding of the potential human health and ecological risks that may be posed by contaminated groundwater, soils, and sediments, including: 1) the presence of highly toxic site contaminants, such as heavy metals, persistent bioaccumulative toxics (PBTs), and volatile organic chemicals (VOCs); 2) the potential for multiple routes of exposure; and 3) the large number of contaminated sites, many of which cover large areas, resulting in high exposure (particularly to ecosystems). In FY 2003, research will be conducted to: 1) reduce uncertainties associated with soil/groundwater sampling and analysis; 2) reduce the time and cost associated with site characterization and site remediation activities; 3) evaluate the magnitude of the risks posed by contaminants to human health and the ecosystem as well as the contributions of multiple exposure pathways, the bioavailability of adsorbed contaminants and treatment residuals, and the toxicological properties of contaminant mixtures; and 4) develop and demonstrate more effective and less costly remediation technologies involving complex sites and hard-to-treat wastes (e.g., via the Superfund Innovative Technology Evaluation program).

Waste identification, waste management, and combustion constitute the three major areas of research under RCRA in FY 2003, as the Agency works towards preventing releases through proper facility management. Waste identification research will focus on multimedia, multi-pathway exposure modeling and environmental fate and transport; physical estimation in support of risk-based exemption levels for wastes; development of targeted exemptions of waste streams that do not pose unacceptable risks; and efforts to streamline the waste de-listing process (i.e., Hazardous Waste Identification Rule (HWIR)). These efforts could significantly reduce compliance costs while still supporting EPA's mission to protect human health and the environment. Waste management research will focus on developing more cost-effective ways to manage/recycle non-hazardous wastes and will examine other remediation technologies, while combustion research will continue to focus on characterizing and controlling emissions from waste combustion.

### **Goal 6 – Reducing of Global and Cross-Border Environmental Risks**

EPA's Global Change Research Program contributes to the Agency's goal of reducing greenhouse gas emissions by providing the knowledge to allow policy makers to find the most

appropriate, science-based solutions to reduce risks to human health and ecosystems posed by climate change (e.g., the impacts climate change could have on the spread of vector-borne and water-borne disease, as well as on air and water quality). The Agency is working to assess the vulnerability of human health and ecosystems to various environmental stressors (e.g., climate change, land-use change, UV radiation) at the regional scale, and to assess adaptation strategies. Global change research will place particular emphasis on continuing its support for the assessment of the consequences of global change within regions and sectors, the ongoing U.S. National Assessment activities, and other related U.S. Global Change Research Program (USGCRP) assessment activities. The Program will emphasize assessing the potential effects of climate change on weather-related morbidity and will continue to support the maintenance of the UV monitoring network and data collection using the network. Additional areas of focus will be continuing the assessment of potential consequences of global change for air quality (which will inform air quality managers and other decision makers about how climate change might affect regional concentrations of criteria air pollutants), and water quality (which will inform managers of public water systems of how climate change might affect water quality in states and localities) as well as the assessment on aquatic ecosystem health.

#### **Goal 7 – Quality Environmental Information**

Research efforts supporting this goal include the Integrated Risk Information System (IRIS) and the Risk Assessment Forum (RAF). IRIS is an EPA database of Agency consensus human health assessment information on environmental contaminants. The database is used extensively by EPA, the states, and the general public to access consistent, reliable toxicity information needed for credible risk assessments. In FY 2003, the Agency will develop new and updated Agency consensus human health assessments of environmental substances of high priority to EPA and make them publicly available on IRIS. The RAF promotes Agency-wide consensus on difficult and controversial risk assessment issues and ensures that this consensus is incorporated into appropriate Agency risk assessment guidance. To achieve this goal, the Agency's Risk Assessment Forum will focus in three areas: risk assessments for children, cumulative risk assessment, and ecological risk assessment. Efforts will result in technical guidance on the identification of appropriate age groupings for exposure assessments for children, technical issue papers, and a framework for preparing cumulative risk assessments.

**Goal 8 - Sound Science.** ORD's research investments in this Goal are arrayed across the following four long-term objectives:

**Conduct Research for Ecosystem Assessment and Restoration.** In the area of ecosystem protection research, EPA will strive to establish baseline conditions from which changes, and ultimately trends, in the ecological condition of the Nation's aquatic ecosystems can be confidently documented, and from which the results of environmental management policies can be evaluated at regional scales. Currently, there is a patchwork of monitoring underway in the



aquatic systems of the U.S. Due to differences in objectives, methods, monitoring designs, and needs, these data cannot be combined to estimate, with known confidence, the magnitude or extent of improvement or degradation regionally or nationally in this economically critical resource. Therefore, the ability to demonstrate success or failure of increasingly flexible watershed management policies, regionally and nationally, is also not possible. EPA's ecosystem protection research program is providing the methods and designs to address these weaknesses. In FY 2003, EPA will produce a report on the condition of the nation's estuaries. This report will provide the first integrated, comprehensive, and statistically valid national report card on the health of a specific aquatic resource. This work is an important step toward providing the scientific understanding to measure, model, maintain, and restore the integrity and sustainability of ecosystems.

Improve Scientific Basis to Manage Environmental Hazards and Exposures. This program supports the development of multimedia and multipathway exposure models and mechanistically-based data, tools and approaches to address uncertainties in human health risk assessment, with an emphasis on infants and children and other sensitive subpopulations. In FY 2003, the Agency will continue to support a Children's Health Research Program specifically targeted at addressing major areas of uncertainty and susceptibility. The Program will focus on issues such as age-related exposures, physiology, and biological responses that may result in increased risks, and research in risk reduction methods. This research provides the scientific underpinnings that will result in better EPA risk assessments for children and ultimately reduced risks from potential environmental health threats. The Agency will continue to address the causes of environmentally-induced childhood disease via the Children's Environmental Research Centers with the goal of eventually decreasing the prevalence of childhood disease. Efforts will focus on childhood asthma and other respiratory diseases, growth and development, and children's exposure and susceptibility to pesticides. EPA will also conduct research on the influence of genetic factors on responsiveness to environmental chemicals. The main scientific question for this research is whether genetic differences are sufficient to influence risk assessment.

Enhance Capabilities to Respond to Future Environmental Developments EPA's leadership role in protecting both human and ecosystem health requires that the Agency continue to be vigilant in identifying and addressing emerging issues. EPA will continue to enhance its capabilities to anticipate, understand, and respond to future environmental developments. EPA will address these uncertainties by conducting research in areas that combine human health and ecological considerations. In FY 2003, research will focus on improving our understanding of the impacts of potential exposure to environmental pollutants, particularly endocrine disrupting chemicals (EDCs) and mercury, on human health and the environment, and on developing approaches to reduce human health and ecological risks. This research will result in accessible and seamless methodologies for combined human health and ecological risk assessments. Additional research results will include an improved framework for decision-making, increased ability to anticipate and perhaps prevent potentially serious environmental risks, improved methods for assessing socio-economic factors, and enhanced communication with the public and other stakeholders.



EPA will also continue the Exploratory Grants research program and will publish its annual general solicitation to promote research in areas where significant gaps in scientific knowledge and understanding exist. This program provides opportunities for individual investigators from the academic research community to conceive, define, and propose research projects.

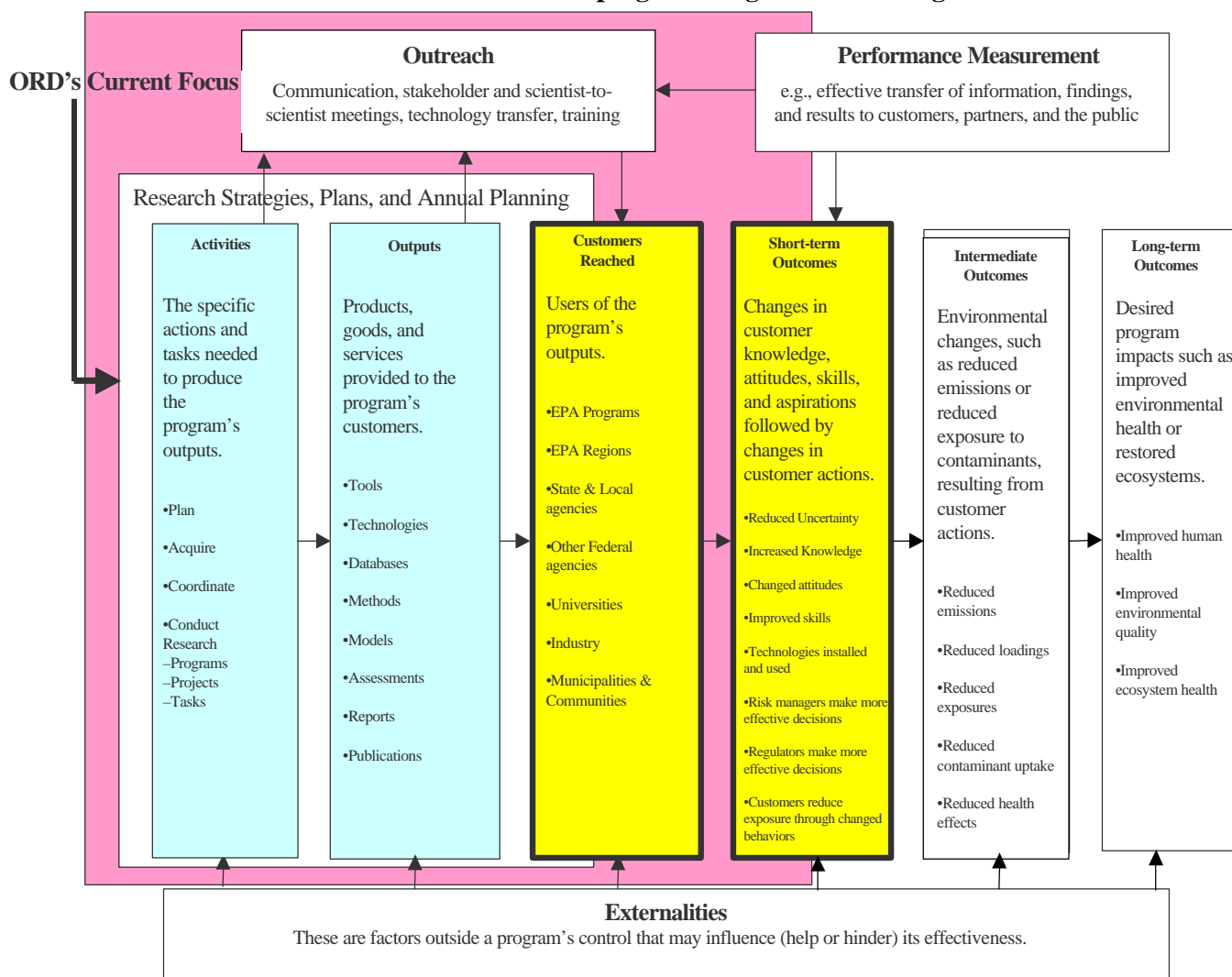
Improve Environmental Systems Management In FY 2003, the Agency will continue its systems-based approach to pollution prevention, which will lead to a more thorough assessment of human health and environmental risks and a more comprehensive management of those risks. Research on clean technologies will be focused on designing, developing and verifying alternative materials, products, and processes that minimize use, emission, and discharge of toxic chemicals in mining, metal finishing, building/construction, and chemical sectors. EPA will develop tools and methodologies to prevent pollution at its source and will evaluate environmental technologies through the Environmental Technology Verification (ETV) Program. ETV is a voluntary, market-grounded verification program for commercial-ready technologies, with over 1,000 stakeholders who represent all points of view within environmental areas. The goal of ETV is to verify the performance characteristics of private-sector-developed technologies so that purchasers, users, and permit writers have the information they need to make environmentally-beneficial decisions. By the end of FY 2003, the ETV program will have delivered more than 150 test plans and protocols, making them available to the entire research and testing community, and will have verified over 200 technologies, making data on their performance available for public use.

## Measuring Progress in Accomplishing EPA's GPRA Goals

ORD volunteered to participate in a pilot program evaluation conducted by the Office of Inspector General. The purpose of the pilot was to determine whether program evaluation techniques are appropriate for measuring progress in accomplishing EPA's GPRA goals; and whether program evaluation techniques are appropriate for evaluating environmental research in the GPRA framework. The pilot findings show an increased focus on research outcomes, a more transparent planning system, and a consistent program design can enhance ORD's ability to meet clients' needs. The Logic Model is a useful tool for visualizing design of a program to identify long-, intermediate-, and short-term outcomes, customers, resources, activities, and outputs.

### ORD-OIG Pilot Program Evaluation

Move ORD's program design focus to the right



## CONCLUSION

In conclusion, let me stress that the goal of research at ORD is to inform risk assessment decisions and to minimize the uncertainties that lead to the need for less than ideal assumptions. ORD's research leads to the science and the tools needed to soundly support decisions on the prevention, regulation, and remediation of environmental degradation and its public health impacts. No other federal agency has a comprehensive program in environmental public health and ecological impacts. I believe that ORD's research program is responsive to the mission needs of the Agency and that we are doing that research in a first rate manner. Working in partnership with EPA's program and regional offices, I am committed to developing the highest quality science to serve as the basis for sound decision-making. I expect ORD's researchers to continue to be on the leading edge of scientific inquiry - expanding our nation's scientific knowledge about the environment, developing guidance for assessing both human and ecological risks, devising new technologies and risk management approaches to both prevent and mitigate pollution, and providing technical assistance to those working, both within the Agency and externally, to protect our environment. Thank you for your time.